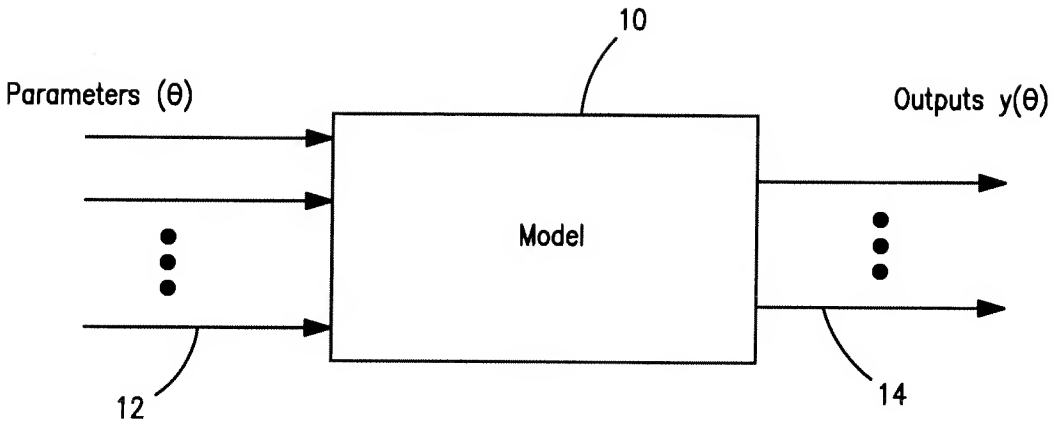

FIG. 1

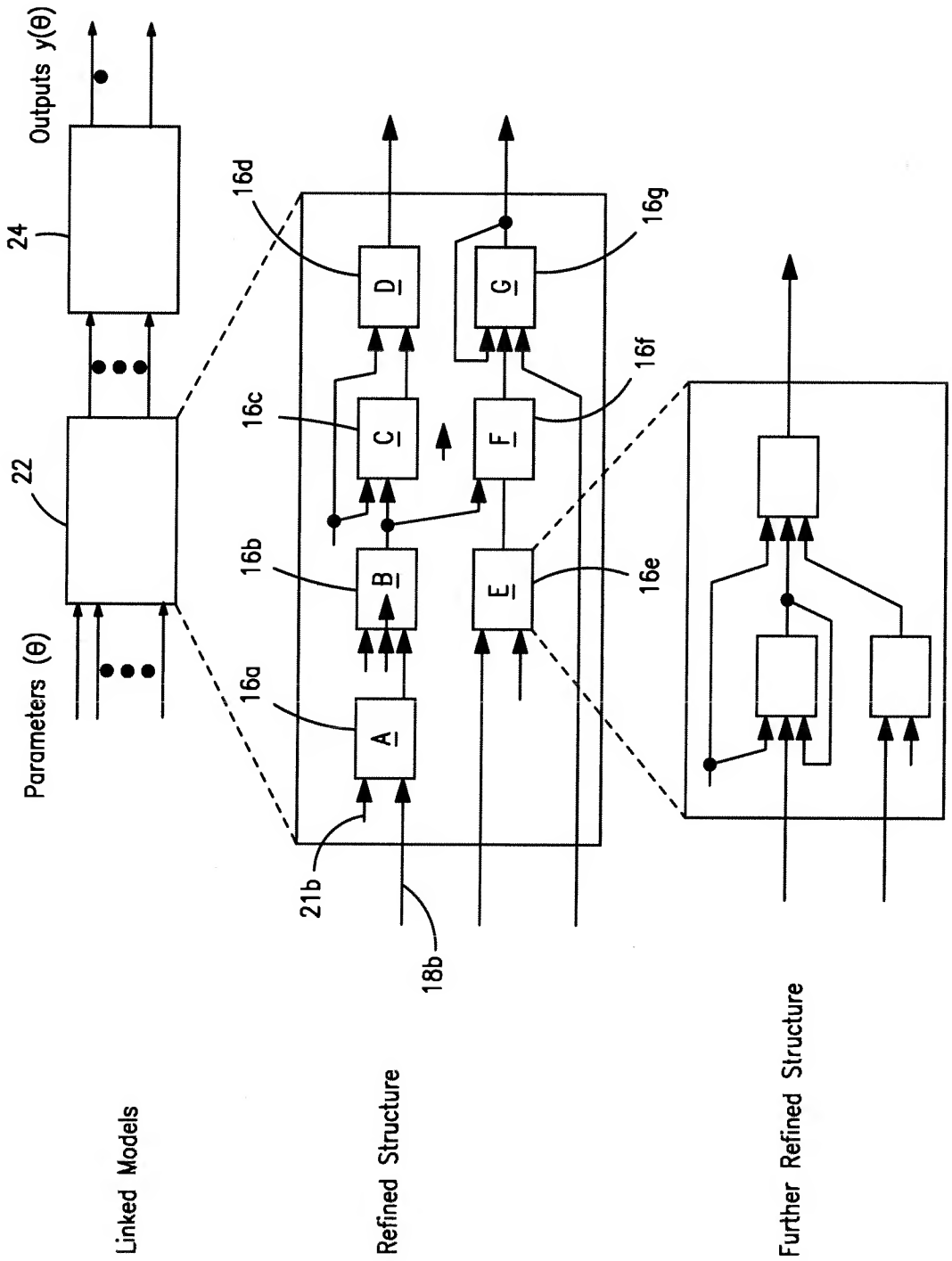
Outputs y(θ)
24
22
Parameters (θ)
16d
16g
16c
16f
16b
16e
16a
A
B
C
D
E
F
G
21b
18b
Linked Models
Refined Structure
Further Refined Structure

FIG. 2

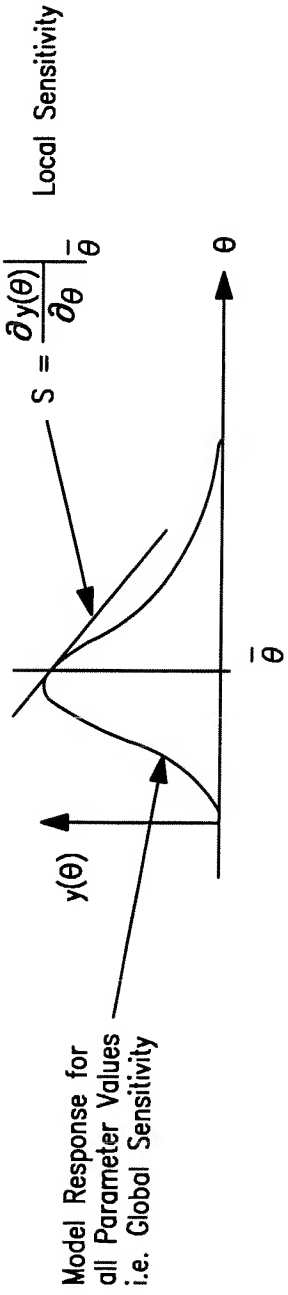
Local Sensitivity
$S = \frac{\partial y(\theta)}{\partial \theta}\Big|_{\bar{\theta}}$
θ
$\bar{\theta}$
y(θ)
Model Response for all Parameter Values i.e. Global Sensitivity

FIG. 3A

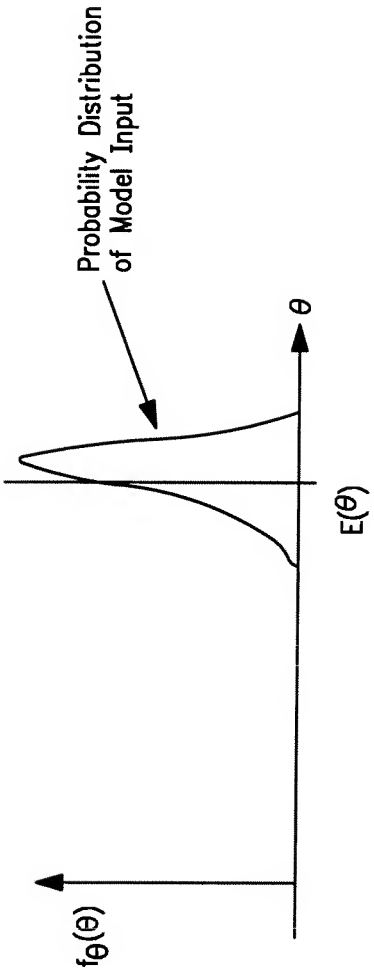
Probability Distribution of Model Input
θ
E(θ)
$f_\theta(\theta)$

FIG. 3B

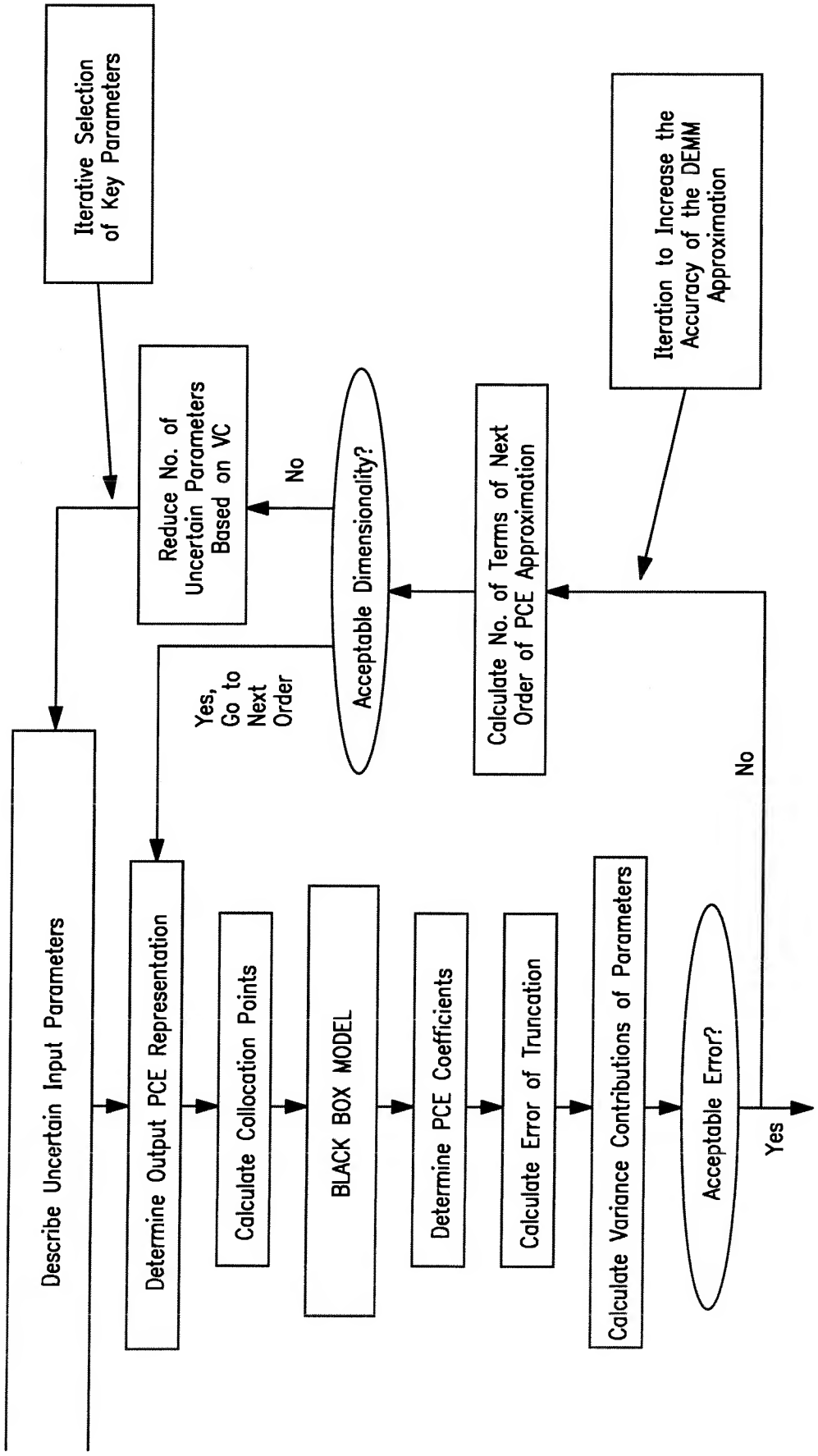
Iterative Selection of Key Parameters
Reduce No. of Uncertain Parameters Based on VC
No
Acceptable Dimensionality?
Yes, Go to Next Order
Calculate No. of Terms of Next Order of PCE Approximation
Iteration to Increase the Accuracy of the DEMM Approximation
Describe Uncertain Input Parameters
Determine Output PCE Representation
Calculate Collocation Points
BLACK BOX MODEL
Determine PCE Coefficients
Calculate Error of Truncation
Calculate Variance Contributions of Parameters
Acceptable Error?
No
Yes

FIG. 3C

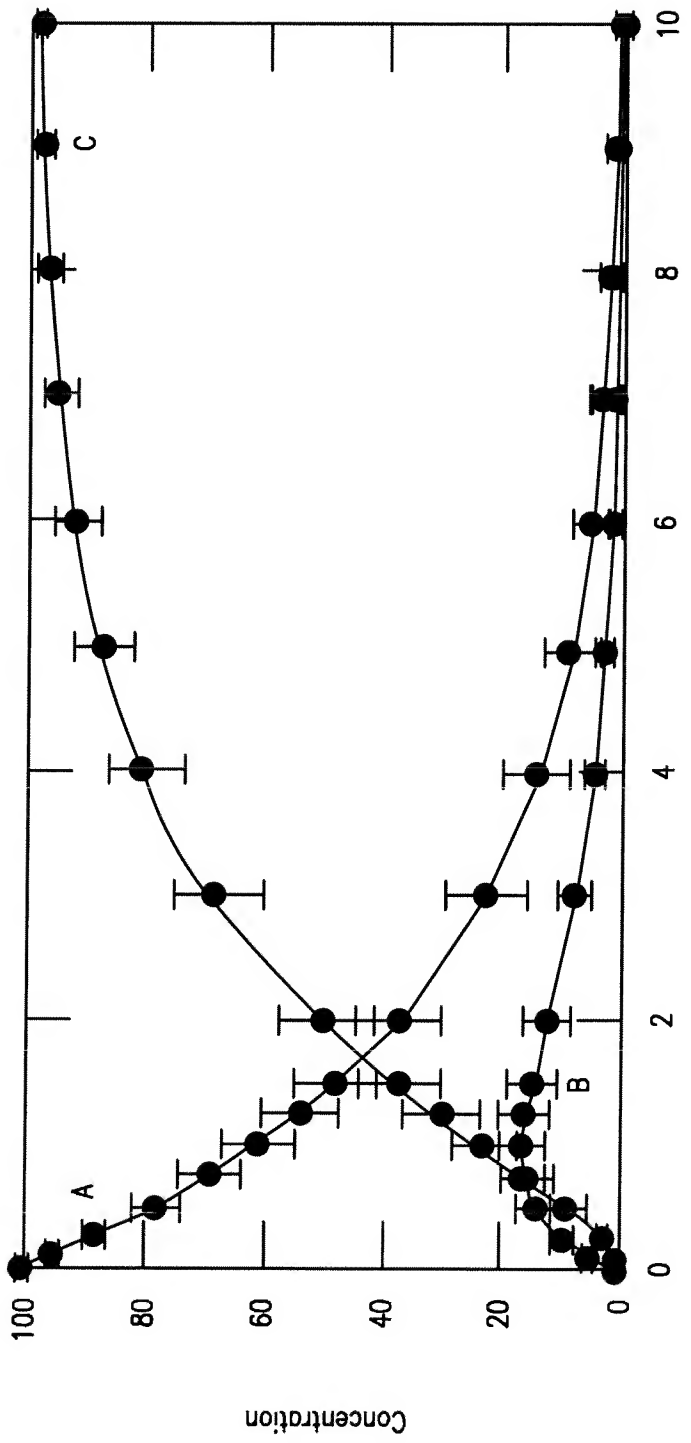

FIG. 3D

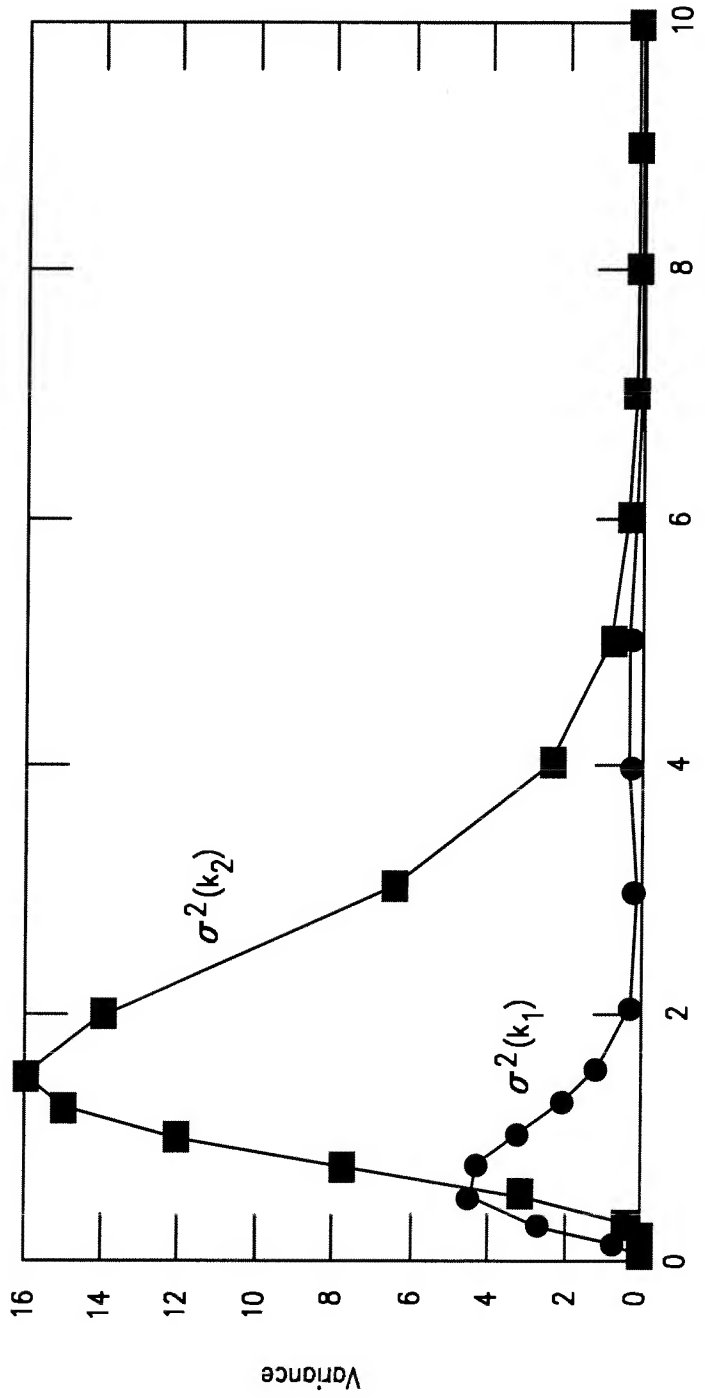

FIG. 3E

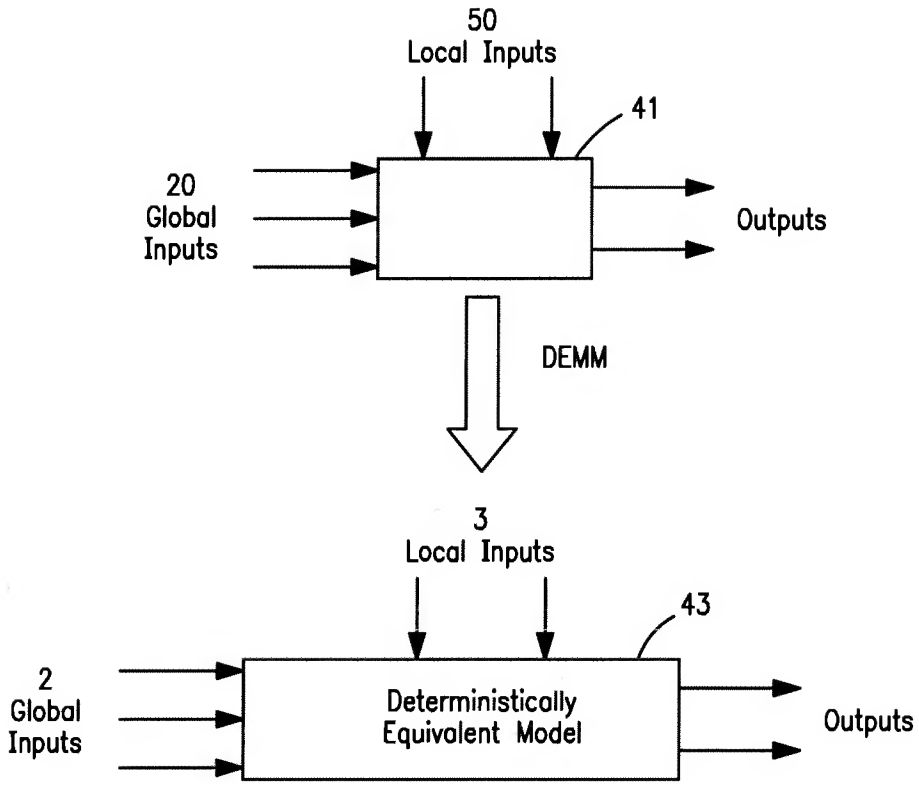
50
Local Inputs
41
20
Global
Inputs
Outputs
DEMM
3
Local Inputs
43
2
Global
Inputs
Deterministically
Equivalent Model
Outputs

FIG. 4

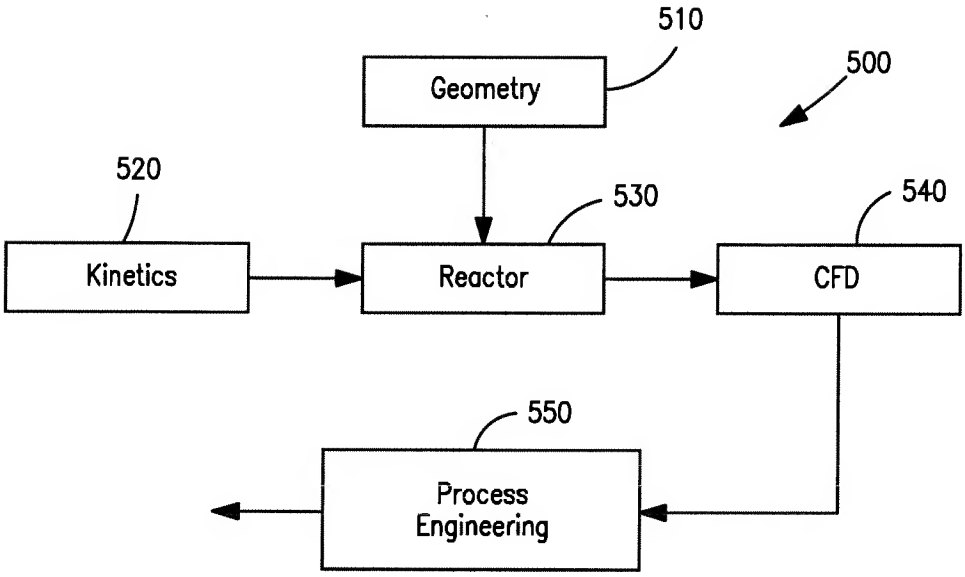
510
500
Geometry
520
530
540
Kinetics
Reactor
CFD
550
Process
Engineering

FIG. 5

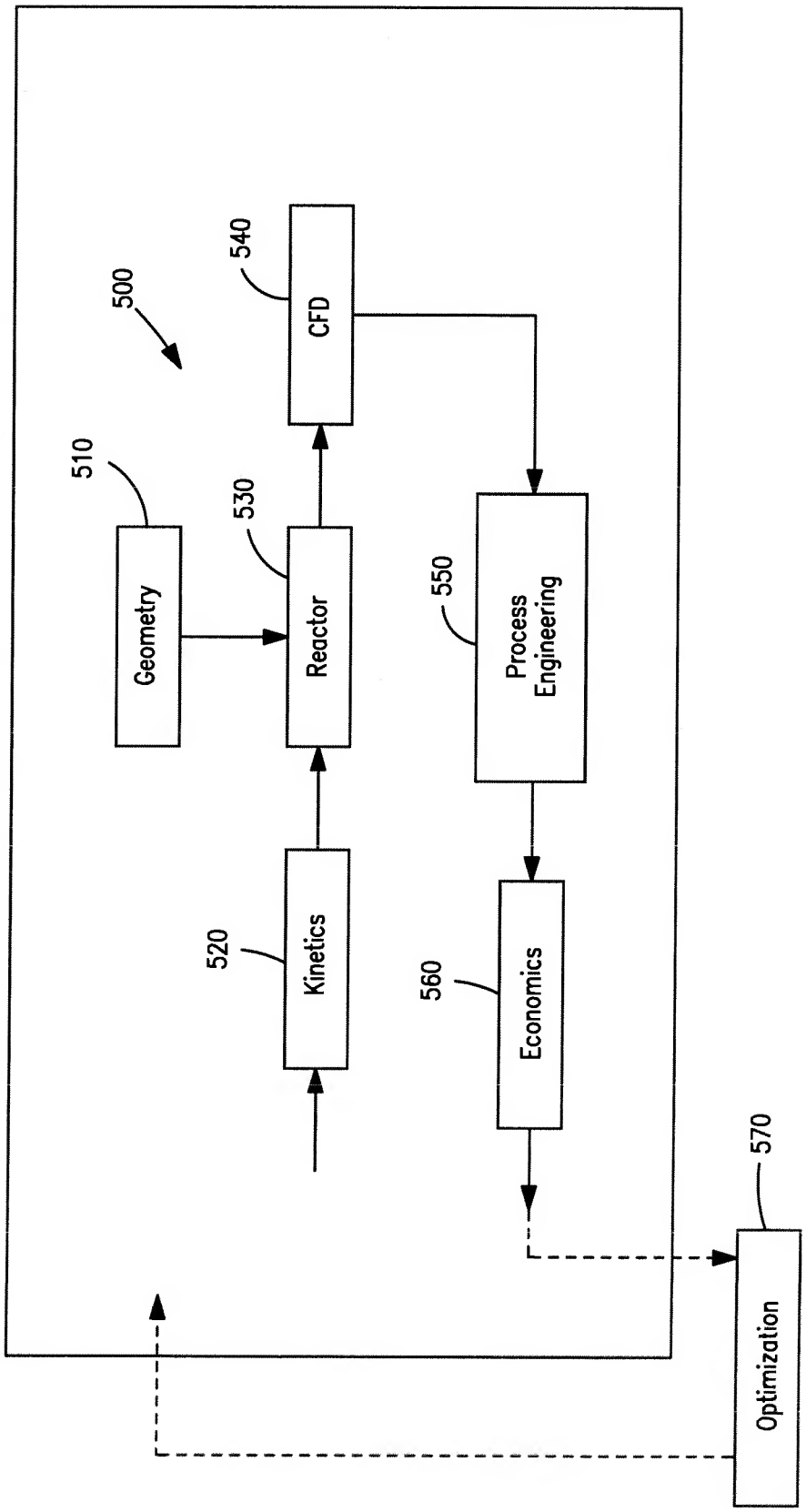
500
510
520
530
540
550
560
570
Geometry
Kinetics
Reactor
CFD
Process Engineering
Economics
Optimization

FIG. 6

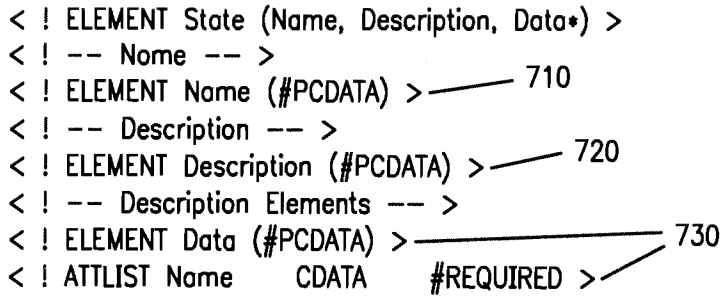
< ! ELEMENT State (Name, Description, Data*) >
< ! -- Nome -- >
< ! ELEMENT Name (#PCDATA) >
710
< ! -- Description -- >
< ! ELEMENT Description (#PCDATA) >
720
< ! -- Description Elements -- >
< ! ELEMENT Data (#PCDATA) >
730
< ! ATTLIST Name CDATA #REQUIRED >

FIG. 7A

```
<?xml Version = "1.0" Standalone = "No" ? >
  < ! DOCTYPE State (View Source for Full Doctype...) >
  < State >
  < Name > PDF < /Name >
  < Description > Normal < /Description >
  < Data Name = "Mean" > 0.200 < /Data >
  < Data Name = "Stdv" > 0.001 < /Data >
  < /State >
```

FIG. 7B

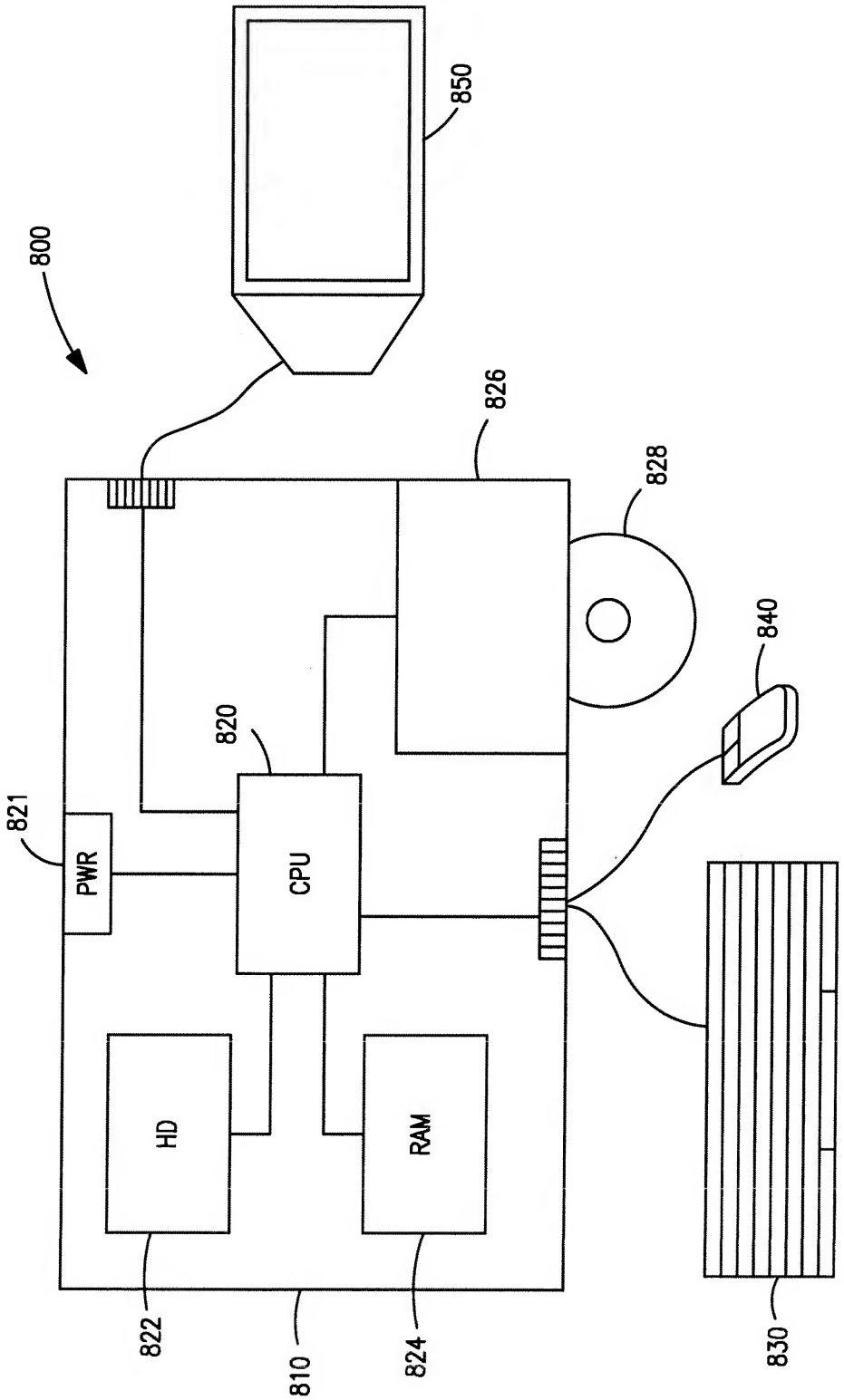

FIG. 8